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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/716,963	11/19/2003	Philip Stephen Goodall	9052-89CT	6457

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MYERS BIGEL SIBLEY & SAJOVEC
PO BOX 37428
RALEIGH, NC 27627

EXAMINER	
GURZO, PAUL M	

ART UNIT	PAPER NUMBER
2881	

DATE MAILED: 06/10/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/716,963	GOODALL ET AL.	
	Examiner	Art Unit	
	Paul Gurzo	2881	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 May 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *6-87* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *6-39,41 and 45-87* is/are rejected.

7)☒ Claim(s) *40 and 42-44* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *19 November 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *0504*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 19, 32, and 41 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. There is no teaching in the specification about the use of an electron multiplier or how it can be used in the apparatus.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 19, 64, and 86 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 19 recites the limitation "the optical detector" in line 3. There is insufficient antecedent basis for this limitation in the claim.

Claims 64 and 86 recite the limitation "the metastable state" in line 2 and "the laser frequencies" in lines 2-3. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 6, 33-35, 38, 45, 52, 60, 62, 66, 67, 74, 82, and 84 are rejected under 35 U.S.C. 103(a) as being unpatentable over Houk et al. (5,313,067) and further in view of Kellner et al. (Analytical Chemistry, Pp 827-828, 1998).

Regarding claims 6, 52, 60, 66, 74, and 82, Houk et al. teach an apparatus for the measurement of isotopes at extremely low concentrations and isotopes of very low abundance comprising an Inductively Coupled Plasma Source Mass Spectrometer (ICP-MS) wherein the ions transmitted by the mass spectrometer are detected with high selectivity (col. 2, lines 61-64 and col. 4, lines 17-20). They do not teach the multi-dimensional detector system, but Kellner et al. teach that the multi-dimensional approach to analyzing samples is already well established (page 827, line 27). In addition, it is obvious that the sensitivity of the spectrometer is improved. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use this multi-dimensional approach with an ICP-MS because the multidimensionality of the data provides more information than separate techniques.

Regarding claims 33-35, 38, 45, 62, 67, and 84, the above-applied prior art does not teach the detecting the claimed concentrations or species. However, Houk et al. teach a mass spectrometer that employs a plasma and is intended primarily for radionuclides (col. 2, lines 2-4). Further, it is obvious that the selectivity is enhanced by specific detection of the transmitted ions or optical probing.

Claims 7-10, 18, 19, 47, and 69 are rejected under 35 U.S.C. 103(a) as being unpatentable over Houk et al. (5,313,067) in view of Kellner et al. (Analytical Chemistry, Pp 827-828, 1998), and further in view of Hu et al. (GB 2288273 A).

Regarding claims 7 and 8, the above-applied prior art does not depict a plurality of sub-systems, but Hu et al. show depict this system in Figure 1 with reference to 50 and 68. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use this sub-system approach with an ICP-MS because the multi sub-systems will help produce a high selectivity because of the unitary response.

Regarding claims 9, 10, 18, 47, and 69, it is an obvious matter of design choice to use a specific and non-specific detector and to use the non-specific ion counting device as the second detector. Further, it would be obvious to correlate them with a high resolution for increased detection results.

Regarding claim 19, Hu et al. teach including an electron multiplier in the detector system (page 8, lines 13-18).

Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Houk et al. (5,313,067) in view of Kellner et al. (Analytical Chemistry, Pp 827-828, 1998) in view of Hu et al. (GB 2288273 A), and further in view of Dowell (GB 2273200 A).

Regarding claims 11, the above-applied prior art does not teach co-incidence detection of the transmitted ions, but Dowell teaches two detector portions (38A and 38B) arranged so that the ion beams strike them in them claimed co-incident manner (page 9, lines 12-14 and Fig. 1, ref. 38A and 38B). Therefore, it would have been obvious to one of ordinary skill in the art at

the time the invention was made to use this co-incident detection for increased accuracy and calibration.

Claims 12, 46, 48-51, 54-58, 64, 68, 70-73, 76-80, and 86 are rejected under 35 U.S.C. 103(a) as being unpatentable over Houk et al. (5,313,067) in view of Kellner et al. (Analytical Chemistry, Pp 827-828, 1998) in view of Hu et al. (GB 2288273 A) in view of Dowell (GB 2273200 A), and further in view of Stuke (4,686,366).

Regarding claims 12, 46, 48-51, 54-57, 64, 68, 70-73, 76-79, and 86, the above-applied prior art does not teach the detection based on optical spectrometry, but Stuke explains that information can be derived by means of mass spectrum information and optical-spectroscopic information (col. 2, lines 4-9, and col. 3, lines 49-67). It is obvious that the state is in resonance with one of the laser frequencies because Stuke teaches a frequency doubled dye laser or an excimer laser (col. 2, line 66 - col. 3, line 30). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use optical spectrometry for another way to accurately detect the transmitted ion beam.

Regarding claims 58 and 80, Houk et al. teach a collision/reaction cell (20) (col. 4, lines 43-61 and Fig. 1).

Claims 13-15, 53, and 75 are rejected under 35 U.S.C. 103(a) as being unpatentable over Houk et al. (5,313,067) in view of Kellner et al. (Analytical Chemistry, Pp 827-828, 1998) in view of Hu et al. (GB 2288273 A) in view of Dowell (GB 2273200 A) in view of Stuke (4,686,366), and further in view of Baba et al. (5,679,950).

Regarding claims 13-15, 53, and 75, the above-applied prior art does not teach detection via resonance scattering processes, but Baba et al. teach that ions are observed for mass

spectrometry through resulting changes in the resonance scattering (Abstract). In addition, Stuke teaches detection via laser-induced fluorescence (col. 1, lines 65-68 and col. 3, lines 49-54). Further, it is obvious that the means for collecting and detecting the resonantly scattered photons is done efficiently. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use resonance scattering and laser-induced fluorescence for increased ion detection accuracy.

Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Houk et al. (5,313,067) in view of Kellner et al. (Analytical Chemistry, Pp 827-828, 1998) in view of Hu et al. (GB 2288273 A) in view of Dowell (GB 2273200 A) in view of Stuke (4,686,366) in view of Baba et al. (5,679,950), and further in view of Twerenhold (5,640,010).

Regarding claim 16, the above-applied prior art does not teach temporal and spatial resolution, but Twerenhold teaches his claimed mass spectrometer having a high spatial resolution (col. 3, lines 49-54). He goes on to explain calculations based on the spatial and temporal resolutions (col. 7, lines 52-67 and col. 8, lines 1-41). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use spatial and temporal resolutions because the sensitivity can be improved by several orders of magnitude.

Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Houk et al. (5,313,067) in view of Kellner et al. (Analytical Chemistry, Pp 827-828, 1998) in view of Hu et al. (GB 2288273 A) in view of Dowell (GB 2273200 A) in view of Stuke (4,686,366) in view of Baba et al. (5,679,950) in view of Twerenhold (5,640,010), and further in view of Karanassios (6,184,982).

Regarding claim 17, the above-applied prior art does not teach the imaging photomultiplier tube, but Karanassios shows an example of a photomultiplier tube detection with respect to spectrometry (col. 14, lines 15-67 and col. 15 and 16). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use this detection as another way to increase the sensitivity and detection of the sub-system.

Claims 20-22, 59, and 81 are rejected under 35 U.S.C. 103(a) as being unpatentable over Houk et al. (5,313,067) in view of Kellner et al. (Analytical Chemistry, Pp. 827-828, 1998), and further in view of Hager (6,028,308).

Regarding claims 20-22, 59, and 81, the above-applied prior art does not teach spread reduction to compress bandwidth or the acceleration or deceleration of the ion beams. However, Hager teaches a means for reducing the relative spread of the ion beam energies (col. 4, lines 21-24). He continues to explain that the ions can be accelerated through the fringing field (col. 10, lines 47-59). It is obvious that the reduction in the relative spread of the ion beams will result in a compression of the optical bandwidth of the transmitted ions. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to reduce the energy spread to produce an enhancement of the ion signal with better sensitivity.

Claims 23-25, 61, and 83 are rejected under 35 U.S.C. 103(a) as being unpatentable over Houk et al. (5,313,067) in view of Kellner et al. (Analytical Chemistry, Pp 827-828, 1998) in view of Holmes (GB 2267994 A), and further in view of Hager (6,028,308).

Regarding claim 23, the above-applied prior art does not teach a front-end collision/reaction cell to reduce the spread of the ion beam energies. However, Holmes teaches a collision cell that is between the ion source and the mass spectrometer (page 5, lines 4-18 and

Fig. 1, ref. 6 and 7). Holmes does not teach the ion beam energy reduction, but Hager teaches a means for reducing the relative spread of the ion beam energies as applied above. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the claimed collision cell to reduce the energy spread to produce an enhancement of the ion signal with better sensitivity.

Regarding claims 24, 25, 61, and 83, Hager teaches accelerating the ion beam as well as manipulating the ion beam energies. It is an obvious matter of design choice to bring the ion beam into resonance within the detection volume of the detector so that proper detection can occur with increased sensitivity.

Claims 26, 63, and 85 rejected under 35 U.S.C. 103(a) as being unpatentable over Houk et al. (5,313,067) in view of Kellner et al. (Analytical Chemistry, Pp 827-828, 1998) in view of Hu et al. (GB 2288273 A) in view of Dowell (GB 2273200 A) in view of Stuke (4,686,366), and further in view of Colvard (5,872,629).

Regarding claims 26, 63, and 85, the above-applied prior art does not teach the use of Doppler shifting. However, Colvard teaches shifting by such suitable means as Doppler shifting the beams (col. 8, lines 13 -30). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the Doppler effect to ensure that the ions to be detected come into resonance with the exciting laser to prevent optical trapping.

Claims 27-32, 65, and 87 are rejected under 35 U.S.C. 103(a) as being unpatentable over Houk et al. (5,313,067) in view of Kellner et al. (Analytical Chemistry, Pp 827-828, 1998) in view of Dowell (GB 2273200 A), and further in view of Hu et al. (GB 2288273 A).

Regarding claims 27-31, 65, and 87, the above-applied prior art does not depict the claimed exit slit assemblies. However, Dowell teaches that data from the ion beams is received by analysis equipment (col. 5, lines 49-53). It is obvious that the claimed multiple exit slit assembly is incorporated (Fig. 1, ref. 38A, 38B). Claims 23-26 are obvious matters of design choice. The applicant has not mentioned that various slit assemblies will give rise to any unexpected results, therefore the prior art teaches on each of these modifications.

Regarding claim 32, Hu et al. teach the use of electron multiplier devices and it is a matter of design choice to use it for the non-specific ion detectors (page 8, lines 13-18).

Claim 36 is rejected under 35 U.S.C. 103(a) as being unpatentable over Houk et al. (5,313,067) in view of Kellner et al. (Analytical Chemistry, Pp 827-828, 1998), and further in view of Lucatorto et al. (4,734,579).

Regarding claim 36, the above-applied prior art does not teach optical isotope shifts, but Lucatorto et al. teach a resonant process that exploits the optical isotope shift to enhance the number of ions of a selected isotope relative to the number of ions of the background isotope (col. 7, lines 48-51). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the claimed shifts to enhance the selectivity.

Claim 37 is rejected under 35 U.S.C. 103(a) as being unpatentable over Houk et al. (5,313,067) in view of Kellner et al. (Analytical Chemistry, Pp 827-828, 1998) in view of Lucatorto et al. (4,734,579), and further in view of Colvard (5,872,629).

Regarding claim 37, the above-applied prior art does not teach the acceleration of the transmitted ions with subsequent Doppler shifting. But Lucatorto et al. teach a system of ion injection optics that serves to extract the ions and accelerate them in a suitable manner for the

mass spectrometer (col. 5, lines, 29-33). They do not teach the subsequent Doppler shifting, but Colvard teaches the Doppler shifting of the ion beams as described above (col. 8, lines 20-30). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use this acceleration and shifting to further enhance the selectivity.

Claim 39 is rejected under 35 U.S.C. 103(a) as being unpatentable over Houk et al. (5,313,067) in view of Kellner et al. (Analytical Chemistry, Pp 827-828, 1998), and further in view of Dowell (GB 2273200 A).

Regarding claim 39, Dowell teaches two detector portions (38A and 38B) arranged so that the ion beams strike them in them claimed co-incident manner (page 9, lines 12-14 and Fig. 1, ref. 38A and 38B). It would be obvious to then improve the detection limit so that the non-specific background is reduced so that detecting the low concentrations of isotopes will occur with higher sensitivity.

Allowable Subject Matter

Claims 40 and 42-44 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The closest prior art does not teach a multi-slit assembly comprising a voltage programmer tube including a non-specific ion detector and a charged particle beam steering optics assembly positioned proximate the exit port of the flight tube.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Bradshaw et al. (5,068,534)

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Paul Gurzo whose telephone number is (571) 272-2472. The examiner can normally be reached on M-Fri. 7:30 - 6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Lee can be reached at (571) 272-2477. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9306 for regular communications and (703) 872-9306 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

PMG
May 28, 2004

JOHN R. LEE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800